



Alcohol and Pregnancy. No safe amount. No safe time. No safe alcohol. Period.

Diagnosis and Intervention Strategies for Fetal Alcohol Syndrome Children and Adolescents: Perspectives from (Neuro)Psychology

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- Identification and Guidelines
- Intervention
- Neuropsychological Deficits
- The Future



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National Organization on Fetal Alcohol Syndrome

- **We believe that FASD ...**
- is the leading known **preventable** cause of developmental disabilities and birth defects, and a leading known cause of learning disabilities.
- annual births are greater than the new cases of Down syndrome, cerebral palsy, cystic fibrosis, spina bifida, and sudden infant death syndrome – COMBINED. (FASD nearly the same rate as autism.)
- **prevention is at least ten-times more cost effective than the \$1.4 million lifetime cost to treat one person** with Fetal Alcohol Syndrome.
- can affect anyone regardless of ethnicity, income, or educational level.
- is completely preventable.
- children and adults can succeed with access to services and appropriate intervention.
- birth mothers deserve therapeutic intervention and treatment.
- families and caregivers deserve a voice among researchers and policymakers.

A wealth of information on this web page: <http://www.nofas.org/>



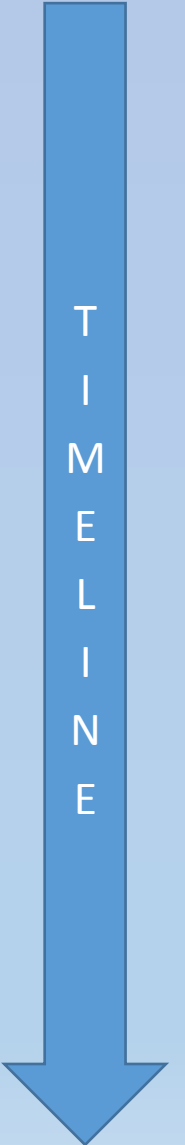
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Fetal Alcohol Syndrome (FAS): Some Landmarks



- In France: 1968: Lemoine et al (described 127 offspring of chronic alcoholics)
- In the USA: 1973: Jones, Smith, Ulleland, and Streissguth; Jones and Smith: First to use the term fetal alcohol syndrome. Began a new research era. (Identified growth deficiency, intellectual handicap, and craniofacial abnormalities)
- The Pregnancy and Health Program 1978 in King County, Washington (AKA The Seattle Study)
Before this program 1/3 of the county's residents believed three or more drinks a day was safe during pregnancy: **The public reaction? ANGER!!!**
- **1993:** the Academy of Pediatrics stated ANY alcohol during the pregnancy was harmful.
- 1999 Fetal Alcohol Awareness. Alcohol awareness color is blue.
 - Every year on September 9, communities throughout the United States and the world observe FASD Awareness Day. Events are held at 9:09—the 9th minute of the 9th hour of the 9th day of the 9th month of the year. This date and time is used to remind women not to drink during the 9 months of pregnancy. The first Awareness Day was held on 9/9/99

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How big of a problem?

- Full FAS
 - 0.2 to 1.5 cases per 1000 births (CDC, 2002; various parts of US)
 - 0.3 per 1000 (2009 data, multi-state study, ages 7 to 9, CDC, 2015)
- FASD's
 - Estimate is 2-5% of US population (May et al., 2009, 2014)
- FASD's are considered both a birth defect and a developmental disability
- Incidence greater in Native Americans and dependent upon which nation: Navajo 1 in 690; Pueblo 1 in 495; Plains 1 in 102.

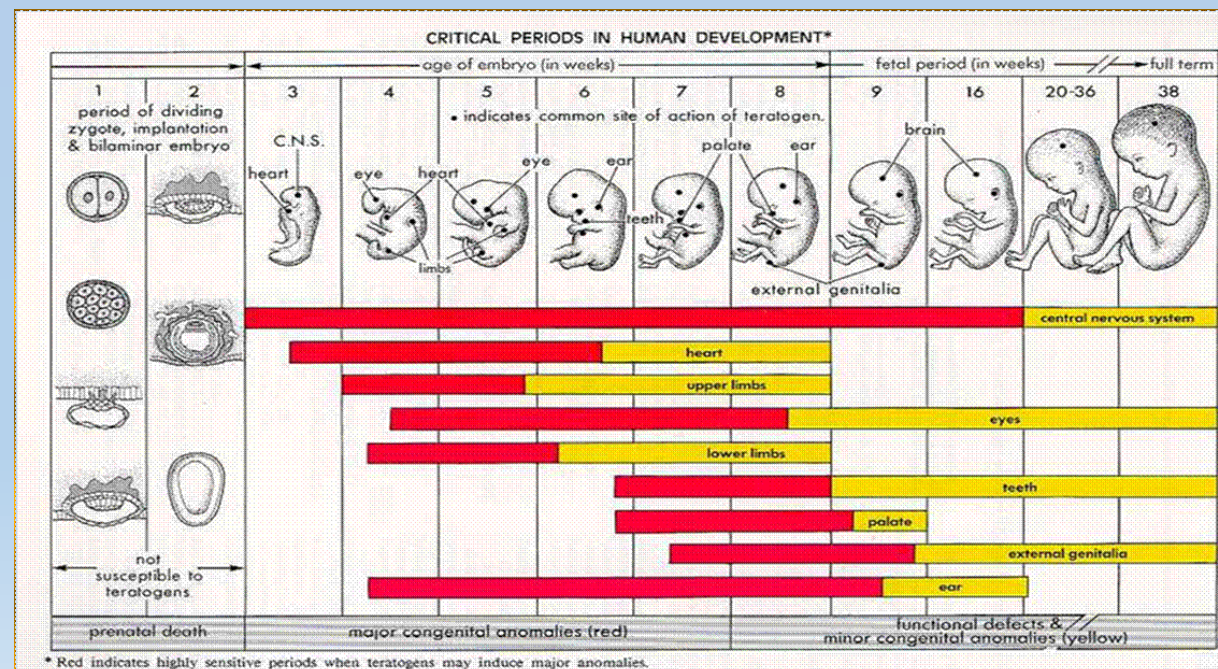


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Fetal Alcohol Spectrum Disorder

- term adopted in 2006

- Amount/dose
- Timing
- Prenatal environment (care, nutrition)
- Genetics
- Subsequent postnatal environment





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Terminology

- FETAL ALCOHOL SPECTRUM DISORDER
 - Fetal Alcohol Syndrome
 - Partial Fetal Alcohol Syndrome
 - Neurobehavioral Disorder associated with prenatal alcohol exposure (ND-PAE)
 - Alcohol Related Birth Defects ARBD
- Other:
 - Gestational Alcohol Exposure
 - Alcohol Encephalopathy



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DSM-5 recognition

- Neurobehavioral Disorders
- Onset age
- Severity scales
- Qualifiers
 - Associated with a known medical or genetic condition or environmental factor
- ND-PAE



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Proposed Criteria: ND-PAE

Neurobehavioral disorder associated with prenatal alcohol exposure

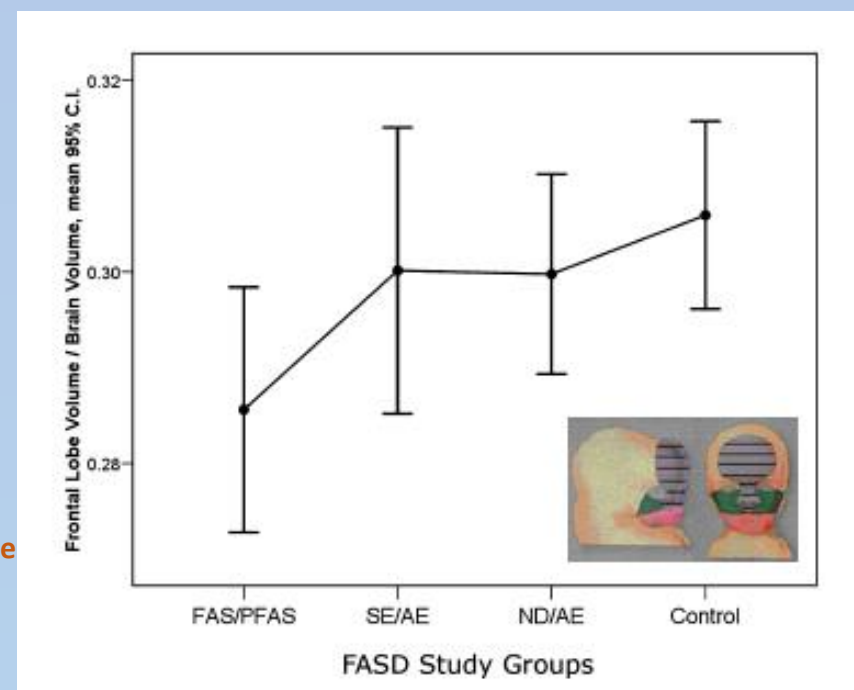
- **Impaired neurocognitive functioning.** At least one of the following:
 - global intellectual performance ≤ 70
 - Executive Function
 - Learning
 - Memory
 - Visual Spatial
- **Impaired Self Regulation.** At least one of the following:
 - Mood or behavioral
 - Attention
 - Impulse control
- **Adaptive Function.** Two or more of the following: (Vineland categories)
 - Communication
 - Social communication and interaction
 - Daily living skills
 - Motor skills
- **More than minimal exposure.** (≥ 13 drinks per month. Also no episode of ≥ 2 drinks)
- **Evident in childhood; clinically significant distress; not explained by other.**



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FAS Criteria: IOM (Bertrand, Floyd, Weber, O'Connor, Riley, Johnson & Cohen, 2004. National task force on FAS and FAE. Fetal alcohol syndrome: guidelines for referral and diagnosis.

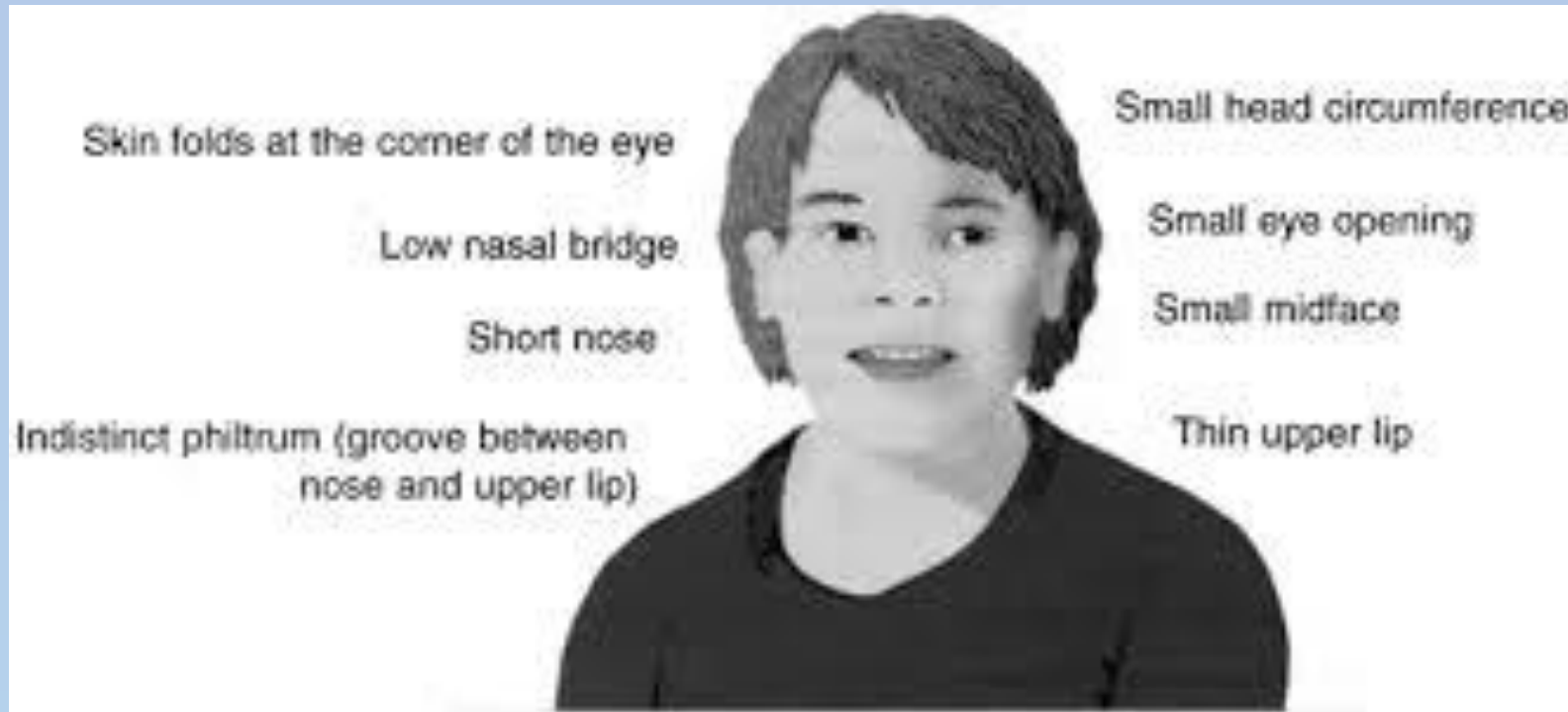
- **Facial dysmorphism**
 - Smooth philtrum, thin vermillion border, small palpebral fissures
- **Growth Problem**
 - Height and or weight $\leq 10^{\text{th}}$ %ile documented at any point in time
- **Central nervous system abnormalities**
 - Structural
 - Head circumference $\leq 10^{\text{th}}$ %ile
 - Neuroimaging abnormalities
 - Neurological.
 - Deficits not due to other.
 - Functional
 - Cognitive or intellectual ≥ 2 standard deviations below mean
 - Functional deficits (≥ 1 standard deviation below average) in at least three
 - Cognitive, developmental or discrepancies
 - Executive function
 - Motor functioning
 - Attention or hyperactivity
 - Social skills
 - Other, including sensory, pragmatic language, memory, etc
- **Maternal alcohol exposure**
 - Confirmed
 - Unknown
- **Diagnosis of FAS requires facial dysmorphism, growth, CNS**



Frontal lobe volume by diagnosis



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But, don't judge a book by it's cover!!



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Partial FAS (pFAS)

- Characteristic facial abnormalities as well as growth retardation, CNS abnormalities, or cognitive abnormalities characteristic of full blown FAS. The facial abnormalities must include 2 of the 3 cardinal facial features.
- Also requires
 - pre- or post-natal growth retardation in height or weight; or small head circumference.
 - OR, evidence of complex pattern of behavioral or cognitive abnormalities inconsistent with developmental level and unexplainable by genetic composition, family background or environment.
- Confirmed use of gestational alcohol required though not required.



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Alcohol-related birth defects (ARBD)

- Rarely used diagnosis
- Congenital anomalies, malformations, and dysplasias
- Two of three dysmorphic facial features

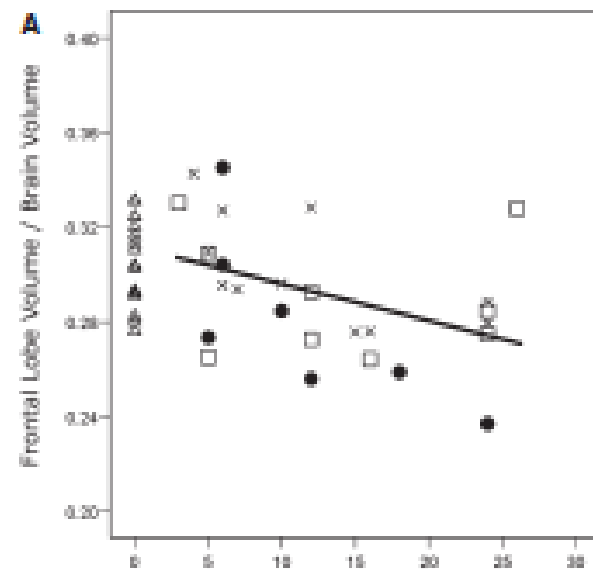
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Binge Exposure

- Binge-like alcohol exposure during the brain growth spurt may be as devastating as chronic exposure through the pregnancy.
- Binge:
 - double the usual amount ingested
 - >3 ounces of absolute alcohol (\approx to 3 shots of 80-proof whiskey)
 - Current standard (CDC): four or more drinks at one time.

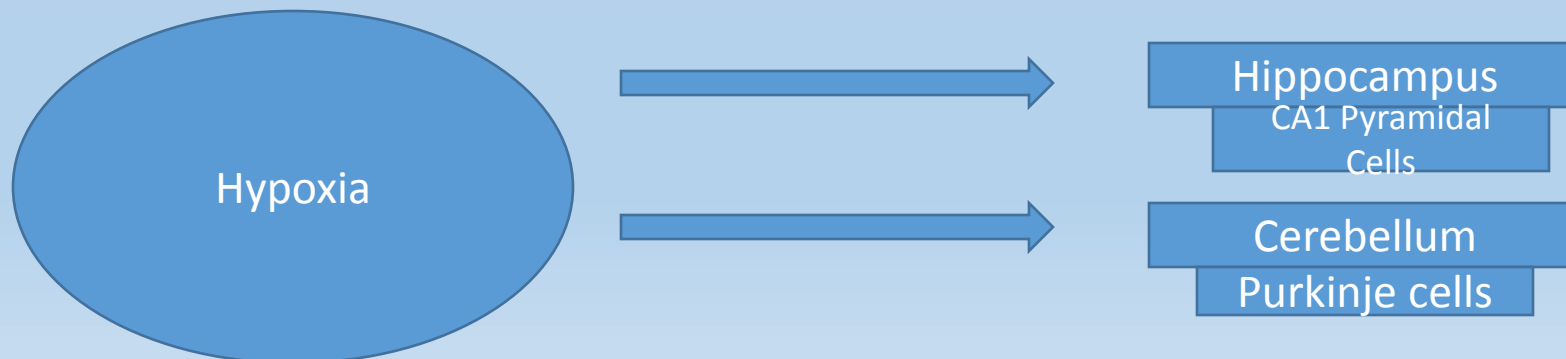




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Alcohol Mechanism of Damage

- Fetal hypoxia: Collapse of umbilical vessels within 10 – 15 minutes and recovery about 30 minutes later (animal model: monkey).
 - Reduced number of hippocampal neurons
 - Lower dendritic spine density
 - Decreased Plasticity

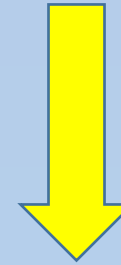
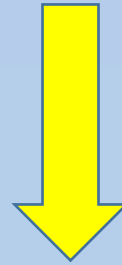




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Interventions

Primary Disabilities
(CNS mediated neurocognitive abilities
and neuromaturation)



Secondary Disabilities
(AKA: Day to Day Life)



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INTERVENTION: DIATHESIS STRESS

- This model suggests individuals who are vulnerable (have PRIMARY DISABILITIES)
 - And are exposed to stress, will develop problems (SECONDARY DISABILITIES).
 - Thus the intervention is to protect the individual, by providing intervention to their primary disabilities.
- PROTECTIVE FACTORS
 - Stable, nurturant , good quality home during critical / important parts of life (experience-dependent/expectant) or majority of life
 - Relationship / Bonding
 - Remain safe from violence
 - Apply for and have appropriate aide (social services)
 - Early identification



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Secondary Disabilities

- School disruption
- Trouble with the Law
- Confinement experience
- Inappropriate sexual behaviors
- Drug/alcohol problems
- Mental Health diagnoses affecting adaptive function
- Dysfunctional family interactions





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No specific treatments exist that are specific to FAS, but the similarity to other diagnoses such as ADHD allows the development of a treatment framework.

- For example, it has been estimated that 50 – 90% of individuals with FASD have ADHD.
- Stimulants? Differential outcomes.
 - May reduce activity, but not improve attention
 - Results may be unpredictable, and even lead to poorer outcomes.
 - May increase spontaneous motor behavior later in life.
 - Clinical trial for Strattera underway.
 - In general, not a great response to methylphenidate
- Impact of nutrition during pregnancy (increasingly studied; for example mitigating effect of iron or other vitamins)



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ADHD in FAS. It may not be the same.

- ADHD affects up to 11% in the population.
- A recent (2015) meta-analysis looking at executive functions
- In FASD: planning, fluency, set shifting, working memory
- In ADHD without FAS: Working memory
- (These groups could not be differentiated on the basis of inhibitory deficits.)



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- In comparison to children with ADHD, neuropsychological evaluation can provide information about areas of information processing deficit such as
 - Visual spatial
 - Encoding of information
 - Flexibility in problem solving
 - Math problem solving
 - General intellectual
 - Etc.
- The above do not tend to be problem areas in individuals with ADHD only.



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Early and family oriented interventions

- In 2001, in response to the Healthy Children Act of 2000, the CDC provided funding to five grantees to develop systematic, specific and scientifically evaluated children with FASDs and their families.
 - Project Bruin Buddies
 - Math Interactive Learning Experience
 - Neurocognitive Habilitation
 - Parent-Child Interaction Therapy



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Bruin Buddies:

96 children 6 – 12 years completed the study.

Vineland Social Composite $z \leq 1.0$; verbal IQ ≥ 70

- Parent assisted children's friendship training
 - Target areas: understanding social cues, indiscriminant social behavior, communicating in social contexts
 - Skills taught: a) social network formation with the aid of b) informational interchange with peers leading to a common ground activity, c) entry into a group of children already in play, d) in home play dates, and conflict avoidance and negotiation.
 - Results was improvement at home as a result of treatment, though not in the classroom. More work was suggested.

O'Connor et al., (2006) J Consulting and Clinical Psychology



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Georgia: Socioeconomic Habilitation using the Math Interactive Learning Experience

56 children 3 – 10 years of age. Consistent caregiver for 6 months before and after the study.

- Objective: to improve behavioral and mathematic functioning of alcohol affected children.
 - 6 weeks of math tutoring
 - Active learning approach using “plan-do-review” methodology
 - Caregivers received instruction in supporting math learning and weekly home assignments to compliment individualized tutoring sessions
 - Education to the teachers about alcohol related neurodevelopmental problems
- Participants did make gains in math and behavior as assessed via pre- and post- testing with CBCL.



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Neurocognitive habilitation for children with FASDs (Children's Research Triangle)

78 children, 40 received the intervention. Specific ages not given.

- Recipients: Children with FASDs who had been adopted or who were in foster care.
 - These children do not have the protective factors of
 - Being raised in a stable nurturing home
 - Diagnosis before age 6; receiving early intervention
 - No sexual or physical abuse history
 - Not changing households every few years
- Core components: education and support to family
 - Also executive function
 - Alert program (car engine as a metaphor): 12 weekly 75-min sessions
 - Tools for memory, cause and effect reasoning, sequencing, planning, problem solving
- Results were promising.



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Parent-Child Interaction Therapy (OK)

46 children 3 – 7 years of age.

- Objective: reduce behavior and parenting stress.
- PCIT provides a live coached practice of behavioral parenting skills
 - Enhance parent-child relationship; increase appropriate social skills; reduce inappropriate behaviors; promote positive discipline.
 - 14 weeks 90-min sessions
- Approx 50% attrition rate
- There was improvement, but no significant difference between PCIT and Parent Support and Management group.



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Behavior Consultation Intervention (WA)

52 children 5 – 11 years of age.

- Objective: To develop a program, Families Moving Forward, for families with children with FASDs
 - Positive behavior support techniques
 - (In WA state, 82% of FASD children had disruptive behaviors)
 - That the families tend to be highly stressed is not helpful.
 - Quality of caregiving a specific target
 - Parents of FASDs very diverse group of birth, kinship, foster and adoptive
- The program: 9 – 11 months, with at least 16 every-other weekend 90 min sessions. Program was designed with flexibility in mind.



Alcohol and Pregnancy. No

- 501 parent–children dyads in a Michigan-based university hospital.
- Children assessed at ages 6 to 7 years of age.
- Almost one fourth of the women denied alcohol use during pregnancy.
- Low levels of alcohol use were reported in 63.8% and moderate/heavy use in 13% of pregnancies.
- Increasing prenatal alcohol exposure was associated with lower birth weight and gestational age, higher lead levels, higher maternal age, and lower education level, prenatal exposure to cocaine and smoking, custody changes, lower socioeconomic status, and paternal drinking and drug use at the time of pregnancy.
- Sood et al 2001

TABLE 1. Demographic Characteristics by Alcohol Exposure Group

Characteristic	Prenatal Alcohol			P Value
	No (n = 117)	Low (n = 323)	Moderate/Heavy (n = 66)	
Child				
Age	6.9	6.9	6.9	NS
Gender (% M)	49.6	51.7	53.0	NS
Birth weight	3124.0	3024.5	2699.8	.000
Gestational age	38.6	38.9	37.7	.002
Current lead (μg/dL)	4.8	4.7	6.0	.007
Performance IQ	85.5	85.2	85.0	NS
Mother				
Age	23.2	26.0	28.1	.000
Education	11.4	11.7	11.2	.030
Married (%)	32.8	27.0	21.5	NS
Cigarettes (number/d)	4.0	8.9	14.0	.000
Cocaine use (%)	18.8	45.2	69.7	.000
Current alcohol (oz AA/d)	0.04	0.4	0.5	.000
Current drugs (% use)	0.0	1.5	4.5	.061
Family				
Custody (biological mother)	87.2	85.4	62.1	.000
Custody changes (% yes)	16.5	21.1	35.4	.011
Father lives with child (%)	28.4	21.5	15.4	.108
Father drinks (%)	45.2	80.3	89.2	.000
Father uses drugs (%)	21.7	37.7	44.6	.002
SES	30.7	29.9	25.1	.001
HOME inventory	32.8	31.8	28.9	.012
Violence exposure	14.1	13.3	13.7	NS
Maternal depression	16.1	17.2	17.2	NS
SCL-GSI	0.5	0.5	0.5	NS

P values from corresponding *t* or χ^2 analyses. NS indicates not significant; AA, absolute alcohol; SCL-GSI, Symptom Checklist-Global Severity Index.



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The effect was observed at average levels of exposure of as low as 1 drink per week. Although effects on mean scores for Externalizing and Aggressive behaviors were observed at low levels of prenatal alcohol exposure, effects on Delinquent behavior and Total Problem Scores were observed at moderate/heavy levels of exposure.

Children with any prenatal alcohol exposure were 3.2 times as likely to have Delinquent behavior scores in the clinical range compared with non-exposed children.

Prenatal alcohol exposure remained a significant predictor of behavior after adjusting for covariates. Although maternal psychopathology was the most important predictor of behavior.

Sood et al, 2001

TABLE 3. Mean CBCL Raw Scores by 3 Group Alcohol Exposure

Parameter	Prenatal Alcohol Exposure			P Value
	No	Low	Moderate/ Heavy	
Externalizing	8.5	11.1	13.2	.002
Aggression	6.9	9.0	10.5	.003
Delinquent	1.5	2.1	2.7	.005
Internalizing	5.1	6.4	6.8	.105
Anxious/depressed	2.5	3.2	3.3	NS
Somatic complaints	1.1	1.2	1.5	NS
Withdrawn	1.7	2.2	2.1	NS
Neither externalizing nor internalizing				
Social problems	1.9	2.4	2.3	NS
Attention problems	3.2	3.7	4.4	NS
Thought problems	0.7	0.8	0.9	NS
Total score	23.7	29.0	32.2	.025

NS indicates not significant.



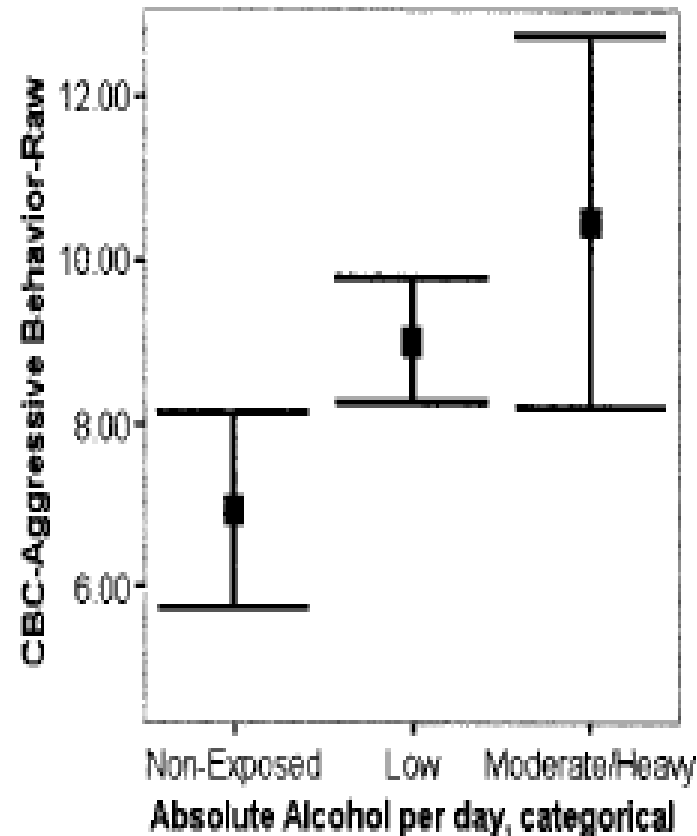
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TABLE 4. Percentage of CBCL T Scores Above Clinical Cutoff Points by 3 Group Alcohol Exposure Status

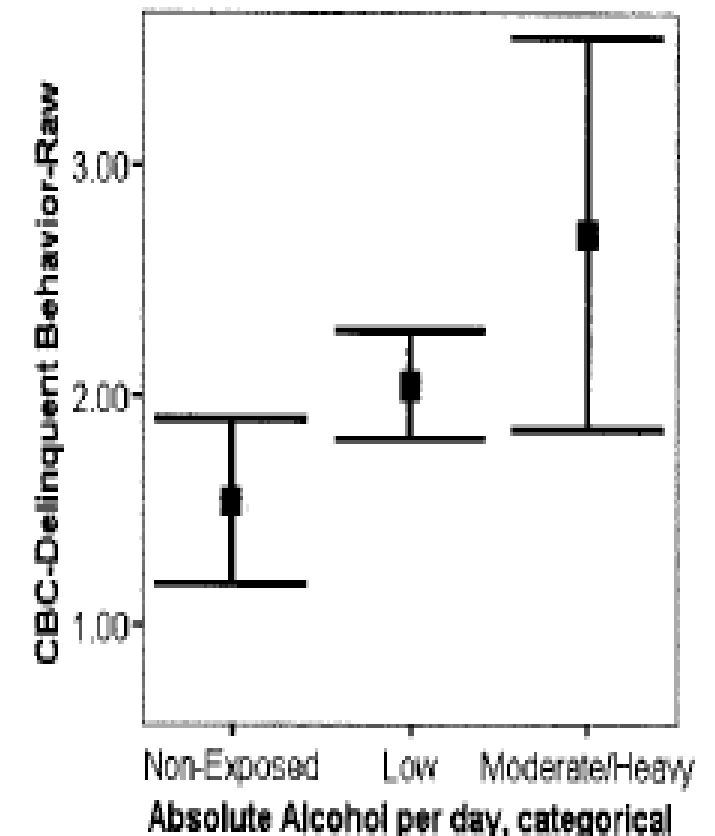
Parameter	Prenatal Alcohol Exposure			P Value
	No	Low	Moderate/Heavy	
Externalizing	14.8	22.5	29.7	.056
Aggression	11.3	12.3	21.9	.092
Delinquent	5.2	14.2	18.8	.014

- Children who are exposed to alcohol have significantly greater odds of having delinquent behavior.
- Sood et al., 2001

Aggressive Behavior



Delinquent Behavior





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Burd et al 2003

>70% Native American; Chance for ADHD, developmental, learning, and social problems increased by 37 to 82%
For anger 38%

Table 1
Significant comorbid risk factors in FAS, partial FAS, and children without FAS

Comorbid mental disorder	FAS		Partial FAS		No FAS		FAS to partial FAS		FAS to no FAS		Partial FAS to no FAS	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	RR	<i>P</i>	RR	<i>P</i>	RR	<i>P</i>
ADHD	111	(73.0)	108	(71.5)	32	(36.8)	1.03	0.870	1.76	<0.001	1.82	<0.001
Learning disability	54	(35.5)	52	(34.4)	12	(13.8)	1.02	0.938	1.43	<0.001	1.44	<0.001
Mood disorder	12	(7.89)	17	(11.26)	6	(6.9)	0.81	0.424	1.19	0.385	1.05	0.979
ODD	25	(16.4)	28	(18.5)	10	(11.5)	0.93	0.742	1.20	0.213	1.15	0.394
Developmental disorder	47	(30.9)	31	(20.5)	2	(2.3)	1.29	0.053	1.60	<0.001	1.74	<0.001
Other medical problems	9	(5.9)	17	(11.3)	2	(2.3)	0.67	0.146	1.46	0.027	1.30	0.334
Sleep problem	19	(12.5)	31	(20.5)	11	(12.6)	0.72	0.084	1.21	0.174	1.00	0.999
Anger problem	24	(15.8)	50	(33.1)	13	(14.9)	0.58	<0.001	1.38	0.004	1.02	0.999
Other psychiatric symptoms	4	(2.6)	11	(7.3)	5	(5.7)	0.52	0.109	1.09	0.851	0.69	0.387
Self-injury	16	(10.5)	18	(11.9)	6	(6.9)	0.93	0.840	1.21	0.310	1.16	0.483
Social skills	53	(31.9)	63	(41.7)	14	(16.1)	0.86	0.267	1.50	<0.001	1.37	0.003
Alcohol	11	(7.2)	9	(6.0)	2	(2.3)	1.10	0.829	1.31	0.340	1.36	0.186
Heart problem	18	(11.8)	10	(6.6)	7	(8.1)	1.32	0.171	0.92	0.881	1.15	0.482
Seizures	16	(10.5)	6	(4.0)	4	(4.6)	1.50	0.048	0.94	0.999	1.29	0.177



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Take home is the increased risk for mental disorders.

Burd's conclusions:

- Clinicians may wish to speculate on why we continue to view dysmorphia as the essential features of FAS and pFAS when the primary problem is dysfunction manifesting as disorders of development and mental illness.
- We may need to consider dysmorphia as a marker that correlates with severity
- Burd and colleagues advocates that the primary phenotype of prenatal alcohol exposure is neurodevelopmental.



FIG. 1A FASD 4-Digit Diagnostic Code Grid

				3	4	4	4		
Severe	Severe	Definite	(4)		X	X	X	(4)	High risk
Moderate	Moderate	Probable	(3)	X				(3)	Some risk
Mild	Mild	Possible	(2)					(2)	Unknown
None	None	Unlikely	(1)					(1)	No Risk
Growth	FAS	CNS		Growth	Face	CNS	Alcohol		Prenatal
Deficiency	Facial	Damage							Alcohol
	Features								

- **FAS/PFAS:** severe cognitive/behavioral dysfunction and FAS phenotype.
- **SA/AE:** severe cognitive/behavioral dysfunction though without facial dysmorphology.
- **ND/AE:** prenatal alcohol exposure comparable to groups 1 and 2, though in comparison to these groups only mild to moderate cognitive/behavioral dysfunction and also no facial dysmorphology.
- **Normal CNS/AE:** had prenatal alcohol exposure, though no CNS abnormalities, may have had growth deficiency and/or FAS facial/features.

TABLE 7 Child Behavior Check List (CBCL/ 6-18) outcomes (see Figure 2) among the 516 patients administered a CBCL when they were between 6 and 18 years of age.

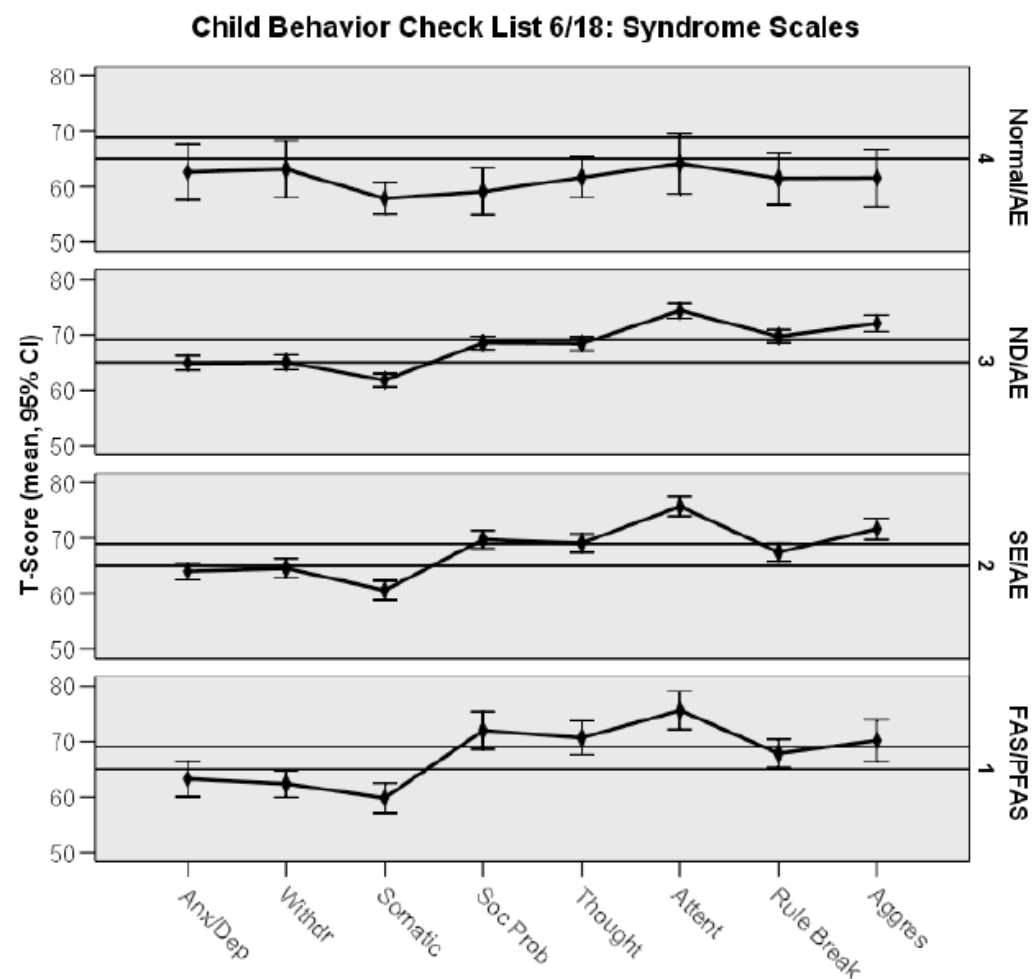
Characteristic	FASD Diagnostic Subgroups										Statistics	
	1. 59 FAS/ 95 PFAS		2. SE/AE		3. ND/AE		4. Normal CNS/AE		Total		ANOVA	
	N = 154		N = 394		N = 722		N = 130		N = 1400		Overall F (p) ^A	Post Hoc Duncan ^B
Problems: T-score ^C	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)		
Internalizing	51	63.4(10.1)	154	64.5(10.9)	270	65.6(10.9)	25	60.8(14.1)	500	64.8(11.0)	1.9 (.14)	--
Externalizing	51	69.1(9.9)	154	69.6(10.9)	270	70.8(10.3)	25	60.3(13.2)	500	69.8(10.8)	7.6 (.000)	123,4
Total	51	71.4(8.9)	154	71.3(9.3)	270	72.1(9.0)	25	61.9(12.7)	500	71.3(9.5)	9.1 (.000)	123,4
Syndrome Scales: T-score ^D												
Anxious/Depressed	51	63.0(11.3)	153	64.0(9.9)	269	64.9(10.9)	25	62.8(12.1)	498	64.3(10.7)	0.8 (.53)	--
Withdrawn/Depressed	50	62.4(8.6)	153	64.6(11.2)	269	65.0(11.1)	25	63.1(12.4)	497	64.5(10.9)	0.9 (.42)	--
Somatic Complaints	51	60.0(9.3)	153	60.6(10.8)	269	61.8(10.0)	25	57.9(7.0)	498	61.0(10.1)	1.6 (.19)	--
Social Problems	50	72.0(12.0)	153	69.7(10.2)	269	68.5(10.2)	25	59.1(10.3)	497	68.8(10.7)	9.3 (.00)	123,4
Thought Problems	50	70.7(10.7)	153	69.1(10.6)	270	68.4(10.2)	25	61.6(8.8)	498	68.5(10.4)	4.6 (.003)	123,4
Attention Problems	51	75.5(11.9)	153	75.7(11.0)	270	74.3(11.4)	25	64.2(13.1)	497	74.4(11.6)	7.6 (.000)	123,4
Rule-Breaking Behavior	51	67.9(8.9)	153	67.5(10.2)	269	69.7(10.0)	25	61.5(11.4)	498	68.4(10.2)	6.0 (.001)	123,4
Aggressive Behavior	50	70.2(13.1)	153	71.7(12.1)	269	72.0(12.2)	25	61.6(12.5)	497	71.2(12.4)	5.7 (.001)	123,4

Washington: Astley 2010



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FIG. 2 Child Behavior Check List³⁴ (CBCL/ 6-18) Syndrome Scales (*see* Table 7) among the 516 patients administered a CBCL when they were between 6 and 18 years of age. All abbreviations are defined in Table 7.



Astley et al 2010

TABLE 11 Mental health disorders reported in the medical records of the 1,064 patients 5 or more years of age at the time of the FASD diagnostic evaluation across the four study groups.

Characteristic	FASD Diagnostic Subgroups										Statistics
	1. 59 FAS/ 95 PFAS N = 154		2. SE/AE N = 394		3. ND/AE N = 722		4. Normal CNS/AE N = 130		Total N = 1400		Chi-square
											Chi (p)
Mental Health Disorders: N (valid%)											
One or more disorders	73	71.6	180	84.1	293	74.0	10	28.6	546	74.5	56 (.00)
ADD/ADHD	53	59.6	161	59.9	233	55.2	0	0	447	53.9	148 (.00)
Adjustment Disorder	4	2.6	8	2.0	29	4.0	3	2.3	44	3.1	3.9 (.27)
Antipersonality Disorder	0	0	0	0	1	0.1	0	0	1	0.1	--
Anxiety Disorder	2	1.3	10	2.5	8	1.1	0	0	20	1.4	5.8 (.12)
Reactive Attachment Disorder	6	3.9	19	4.8	27	3.7	2	1.5	54	3.9	2.9 (.41)
Bipolar/Manic Depression	4	2.6	10	2.5	13	1.8	3	2.3	30	2.1	0.8 (.85)
Conduct Disorder	2	1.3	16	4.1	24	3.3	1	0.8	43	3.1	5.3 (.15)
Depression	7	4.5	23	5.8	32	4.4	2	1.5	64	4.6	4.2 (.24)
Dysthymic Disorder	3	1.9	7	1.8	23	3.2	2	1.5	35	2.5	3.0 (.39)
Obsessive Compulsive Disorder	1	0.6	6	1.5	2	0.3	0	0	9	0.6	6.5 (.09)
Oppositional Defiant Disorder	8	5.2	39	9.9	72	10.0	1	0.8	120	8.6	15.0 (.00)
Post Traumatic Stress Disorder	10	6.5	32	8.1	49	6.8	4	3.1	95	6.8	3.9 (.27)
Suicidal	2	1.3	3	0.8	5	0.7	0	0	10	0.7	1.7 (.64)

Abbreviations: Chi: chi-square test statistic across the 4 study groups. FAS: fetal alcohol syndrome. P: p-value. PFAS: partial FAS. ND/AE: Neurodevelopmental disorder/alcohol exposed. Normal CNS/AE: No central nervous system abnormalities/alcohol exposed. SE/AE: Static encephalopathy/alcohol exposed.

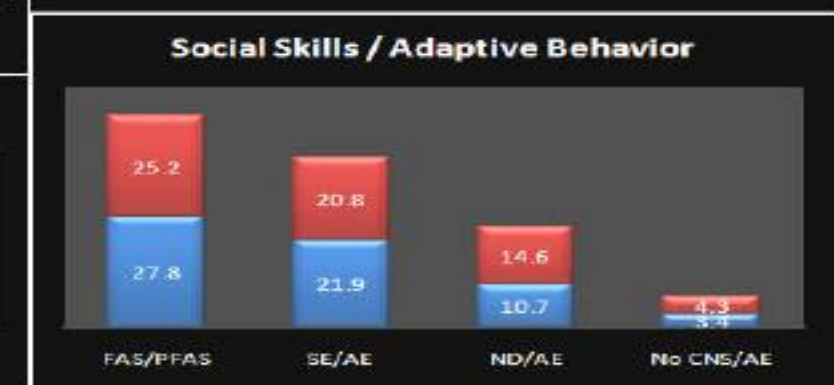
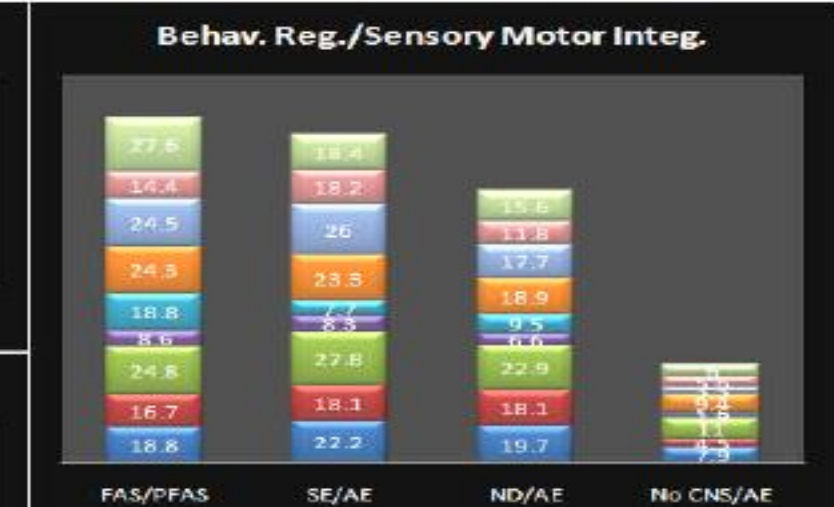
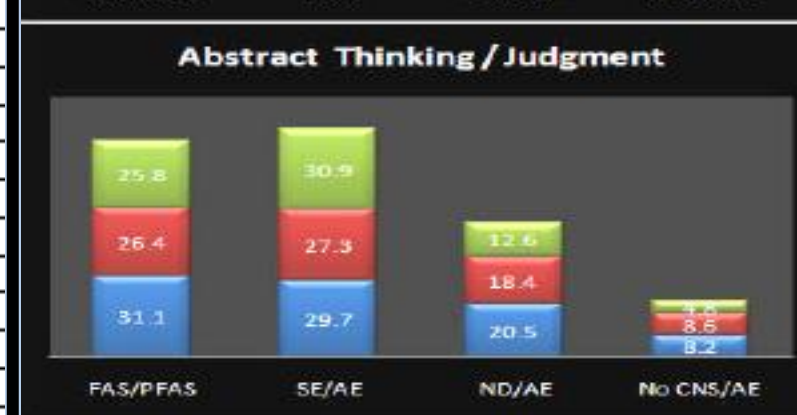


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Neurocognitive (The Holy Grail)

- Executive Function
 - Abstraction/judgment problems
 - Lack of control over emotions
 - Impulsivity
 - Inappropriate/immature social behaviors
 - Difficulty learning from consequences
- Attention (hallmark)
- Visual Spatial/Visual Motor
- Learning and Memory (verbal list learning)
- Motor
- Achievement (Arithmetic/Inability to manage money)
- Adaptive (Greater than expected day to day deficits given their IQ)
- Greater risk of psychiatric difficulties
- Compromises the ability of the neuropil to increase its complexity in response to environmental enrichment

Domain	Behavior
Planning	Needs considerable help organizing daily tasks Cannot organize time Does not understand concept of time Difficulty carrying out multistep tasks
Behavioral Regulation/Sensory Motor Integration:	Poor management of anger/tantrums Mood swings Impulsive Compulsive Perseverative Inattentive Inappropriate activity level Lying/stealing Unusual high/low reactivity to sound/touch/light
Abstract Thinking/Judgment:	Poor judgment Cannot be left alone Concrete, unable to think abstractly
Memory/Learning/Information Processing:	Poor memory, inconsistent retrieval of learned information Slow to learn new skills Does not seem to learn from past experiences Problems recognizing consequences of actions Problems w/information processing speed/accuracy
Spatial Memory:	Gets lost easily. Difficulty navigating from A to B
Social Skills and Adaptive Behavior:	Behaves at a level notably younger than chronological age Poor social/adaptive skills
Motor/Oral Motor Control:	Poor/delayed motor skills Poor balance



Some of the neuropsychological data from Astley 2010



Alcohol and Pregnancy. No

- Parietal region
- Corpus Callosum
- Cerebellum
- Basal Ganglia
- Hippocampus
- Frontal Lobe Areas (increased thickness)f\

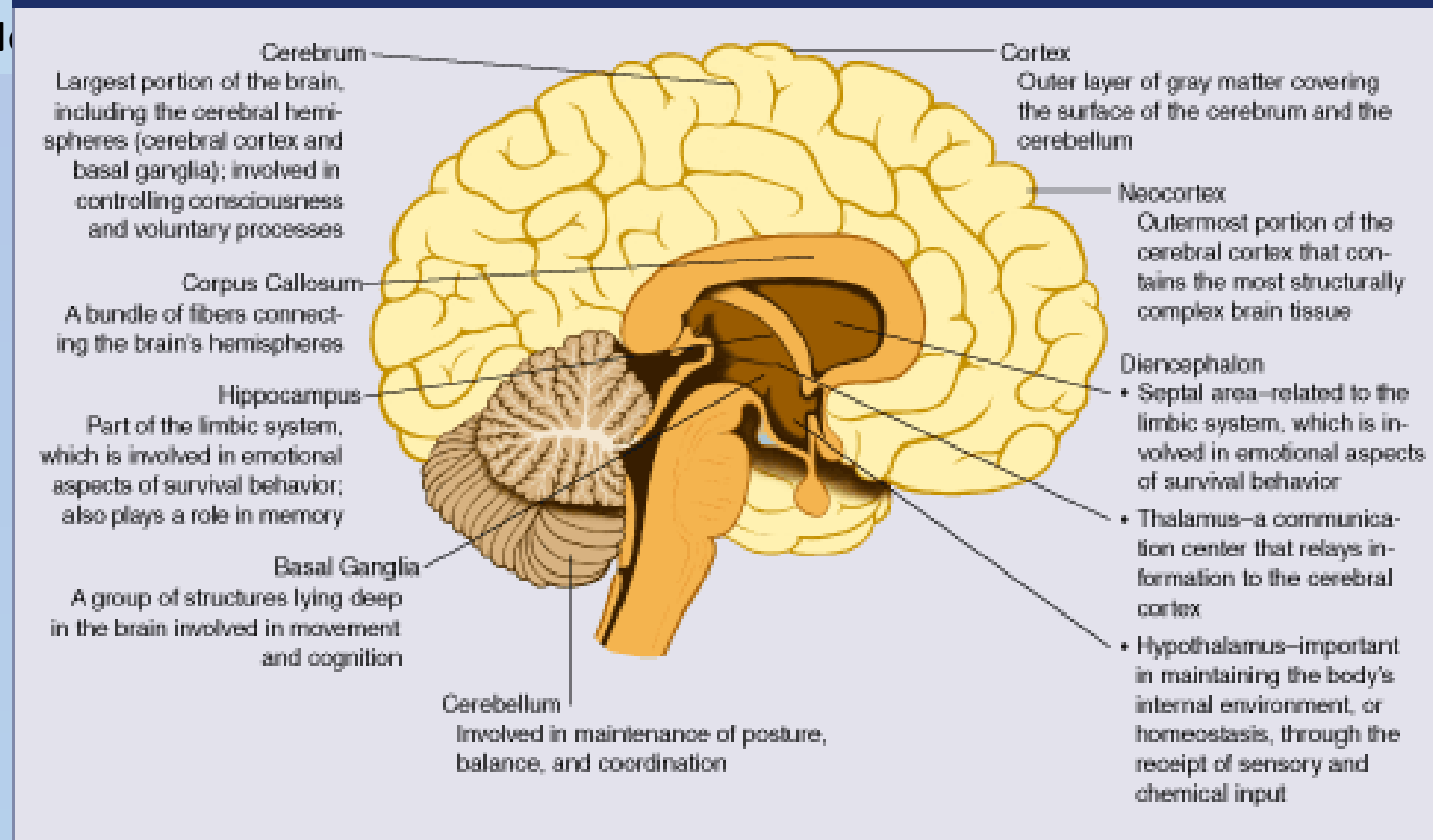


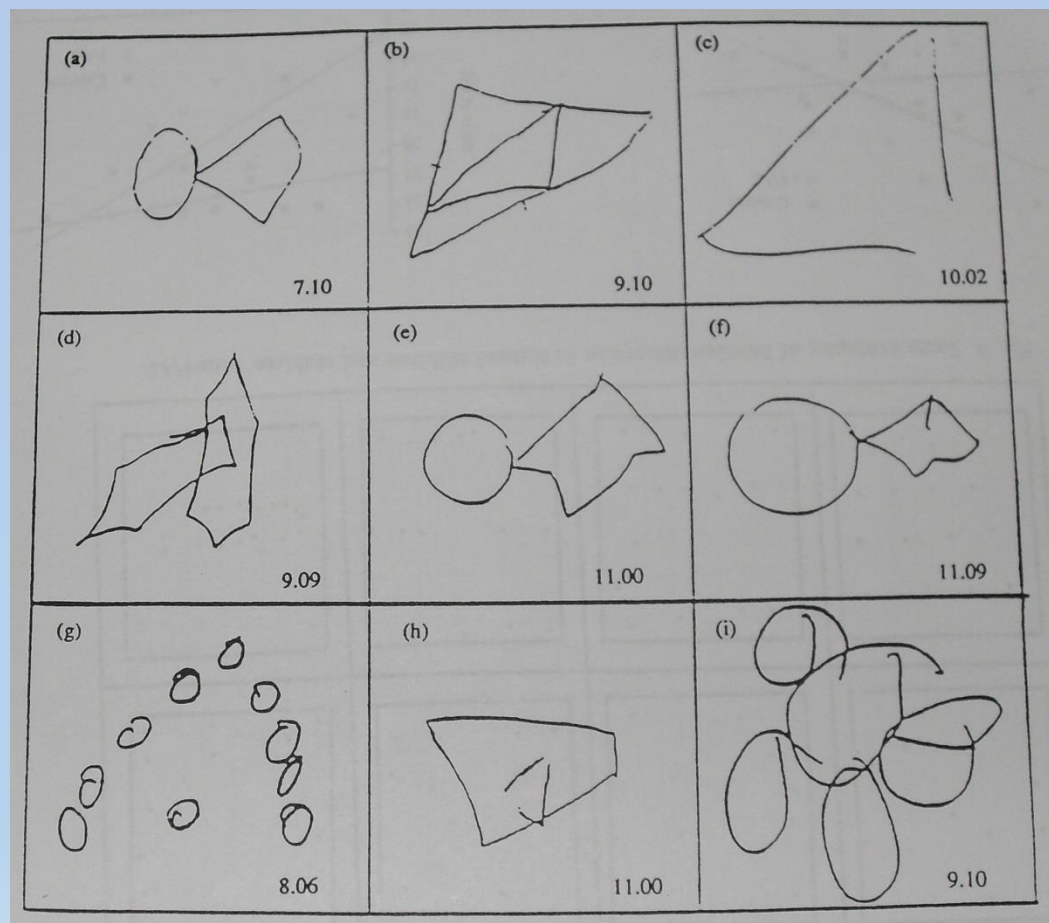
Figure from:<http://people.uwec.edu/piercech/fas/fas...htm>

Brain areas variable between individuals.



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Drawing (VMI) data





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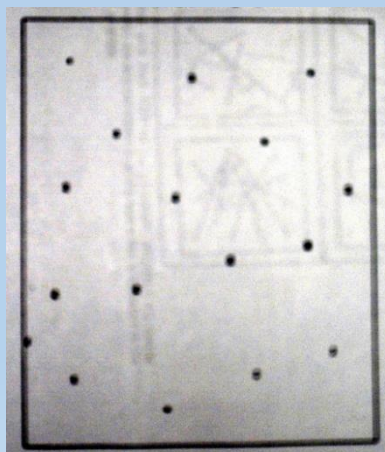
Why does space matter?

- Motor + space = Visual Motor Integration
- Visual Motor Integration + Environmental Input = Behavioral Organization
- Behavioral Organization = Executive Function
- Executive Function = Good Decision Making
- Good decision making = Good Adaptive Skills
- Good Adaptive Skills = Successful Life Experiences

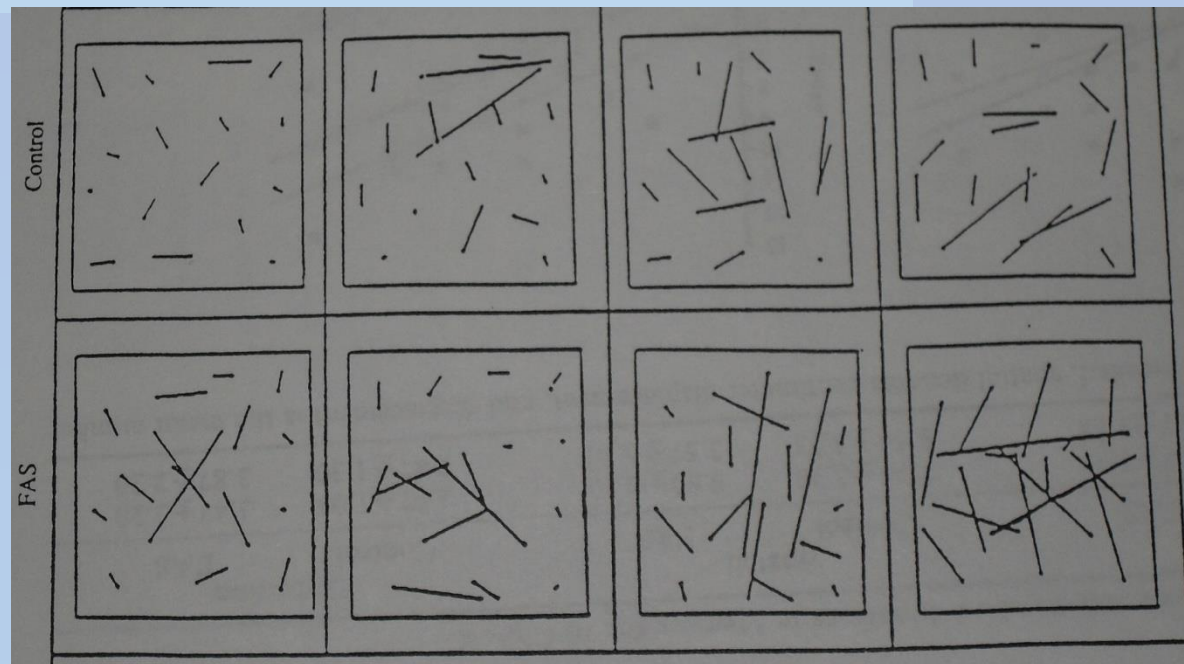


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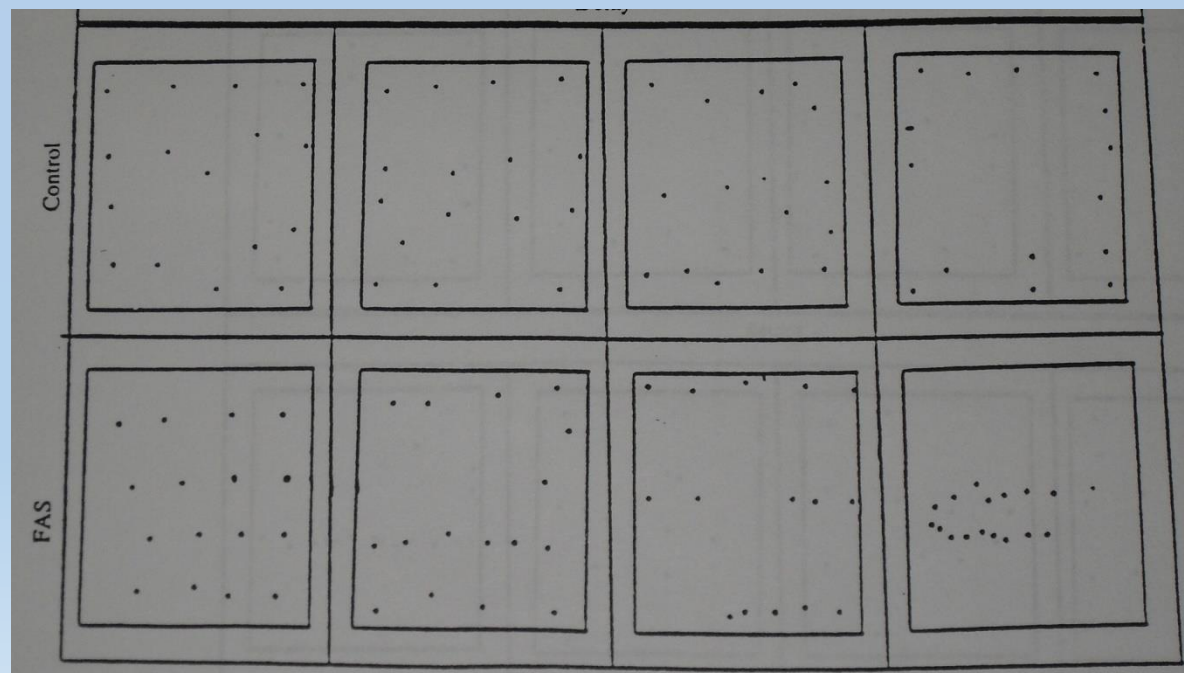
16 Object Spatial Localization/ Distortion



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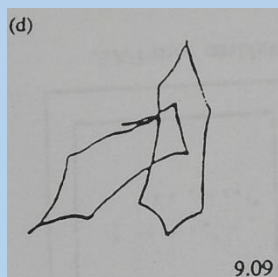
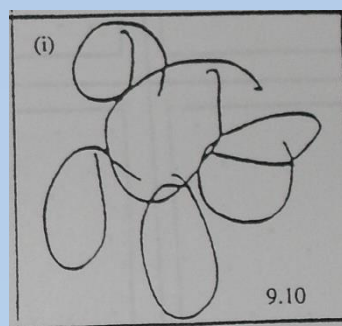
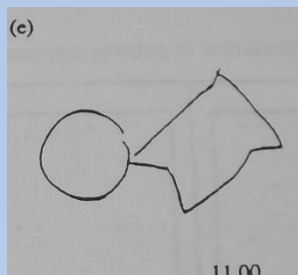


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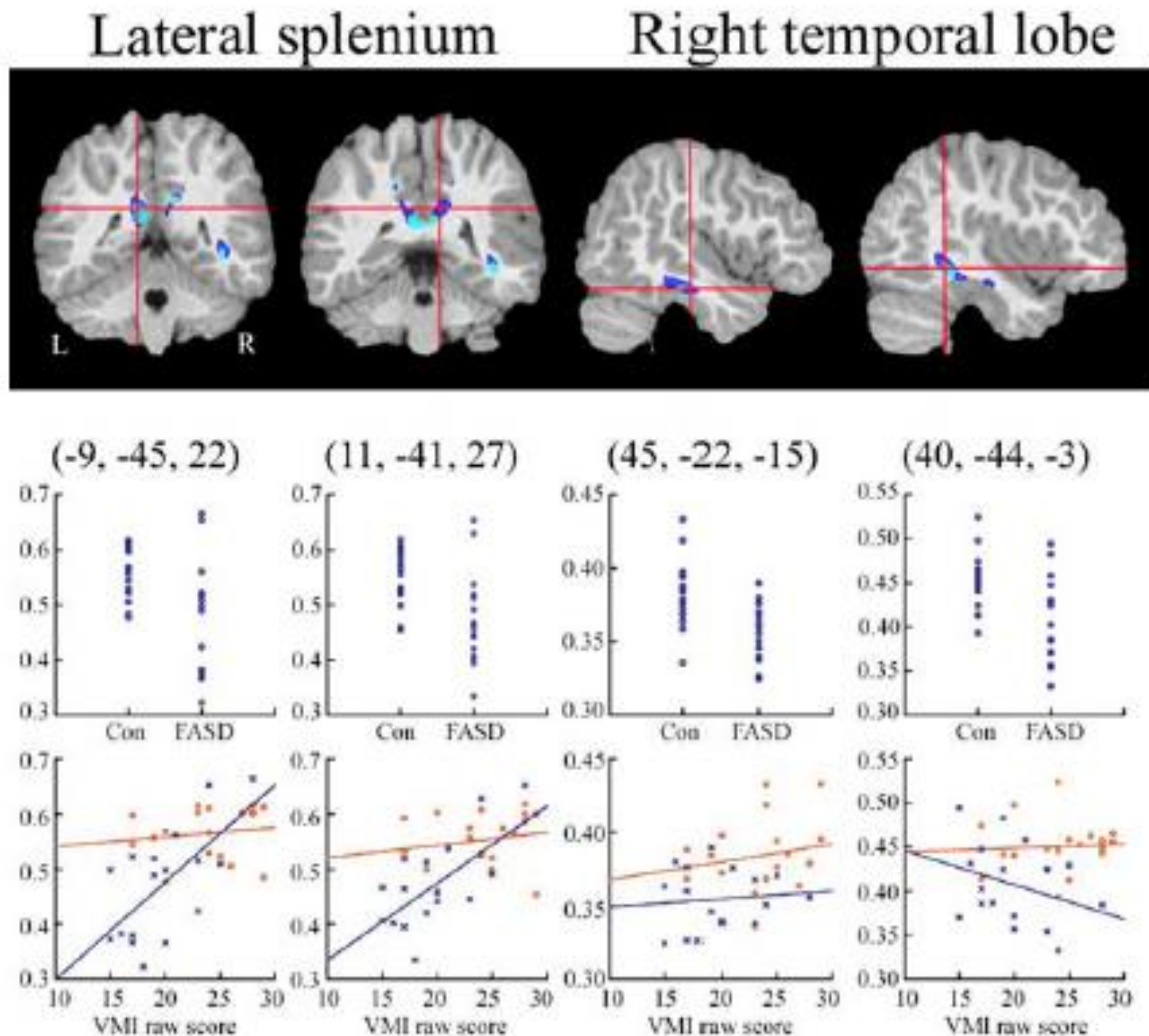




Alcohol and Preg



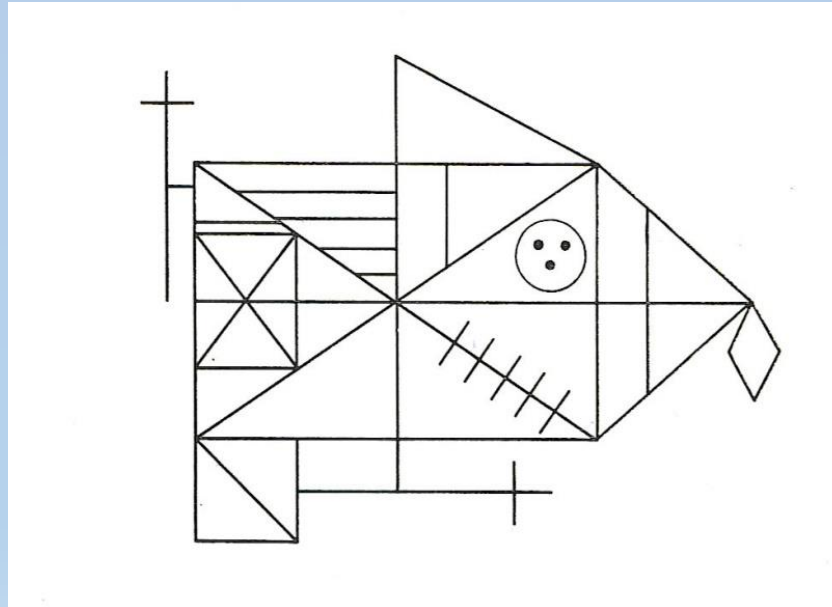
White matter
abnormalities
in brain areas
associated with visual
motor integration.
Sowell, et al, 2008





Higher Level Organization

- Children with FASD demonstrate a new capacity to learn skills, though do so through explicit instruction rather than through observation and abstracting rules , skills an on going knowledge as we typically expect.





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Higher Level Organization

- Applies to information
 - Unrelated or contextual?
 - Making the abstract more concrete. Applying structure. Identify categories.
- Social
 - Friendship group rules
 - Family rules
 - Community
- Writing
 - Outlines
 - Webbing
 - Paragraph Construction
 - Writing Prompts



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The Future

- Neuroplastic Interventions

- Exercise

- Shown to impact brain structure involved in learning and memory
 - Has been used as an intervention for ADHD, anxiety, PTSD, depression and other conditions

- Passive exercise techniques

- Such as yoga beginning to also be shown increased attention to self and impulsivity

- Mindfulness/Meditation

- Attention
 - Impulse Control
 - Awareness of Emotions
 - Social Compassion



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Intervention (Handout)

- **Behavior and Education Therapy**

- According to the CDC (2011), behavior and education therapy perform important functions as part of treating children with ND-PAE. There are substantial venues of support for persons with ND-PAE developmental disabilities; however, research supports the effectiveness of only a few specific to children with ND-PAE. The DSM-5 lists the following behavior and education therapies that have been proven to be effective according to research:
- Friendship training—For many children with ND-PAE, making and keeping friends and socializing with others in general is difficult. Friendship training instructs children with ND-PAE how to interact appropriately with friends, how to enter a group of children already at play, how to coordinate and handle in-home play dates, and how to avoid and work through conflicts.
- Specialized math tutoring—This treatment method offers specialized teaching strategies and tools to help the child with ND-PEA be more successful at math.
- Executive functioning training—Executive functioning teaches behavioral awareness and self-control, and it improves executive functioning skills, including memory, cause and effect, reasoning, planning, and problem solving.
- Parent-child interaction therapy—Parent-child interaction therapy strives to improve the parent-child relationship create a positive discipline program and reduce behavior problems in children with ND-PAE. Parents acquire new skills from a coach.
- Parenting and behavior management training—This behavioral and learning management therapy provides comfort to caregivers, helps to meet the family's needs, and develops strategies that reduce problem behaviors of the child.



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(Handout)

- Motor activities/enrichment
 - Promotes organization of nervous system
- A typically developing toddler may need to try a food 12-15 times before “liking” it. A child with FAS may need more exposures.
- Good sleep patterns
 - Routine, visual schedule, safe environment
- Relationship / attachment building
- Structure. Provide it, teach it.



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(Handout)

- Traditional parenting practices might not be effective for children with ND-PAE. Parent training therapy teaches parents about their child's disability and gives them various ways to work efficiently with their child. This therapy exists in both group situations or with individual families. Programs offering Parent Training specialize in the following:
- Concentrate on the child's strengths and talents
- Accept the child's limitations/Positive Parenting/Differential reinforcement of positive behavior
- Be consistent with everything (discipline, school, behaviors)
- Use concrete language and examples
- Use stable routines that do not change daily
- Keep it simple
- Be specific—say exactly what one intends (and follow through)
- Structure your child's world to provide a foundation for daily living
- Use positive reinforcement often (praise, incentives)
- Supervise: friends, visits, and routines
- Repeat, repeat, repeat



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Web Resources (Handout)

- FAS Community Resource Center: <http://www.come-over.to/FASCRC/>
- National Organization on Fetal Alcohol Syndrome: <http://www.nofas.org/>



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